
Seed
GLOBAL HEALTH
SEPSIS
Registrar Education Series
Updated 08/2022
Dynamed

What is?

Validated tools

What is going on?

Bird’s eye view

Fluids

Antibiotics

Pressors

Investigations

Adjunctive therapy

Check list

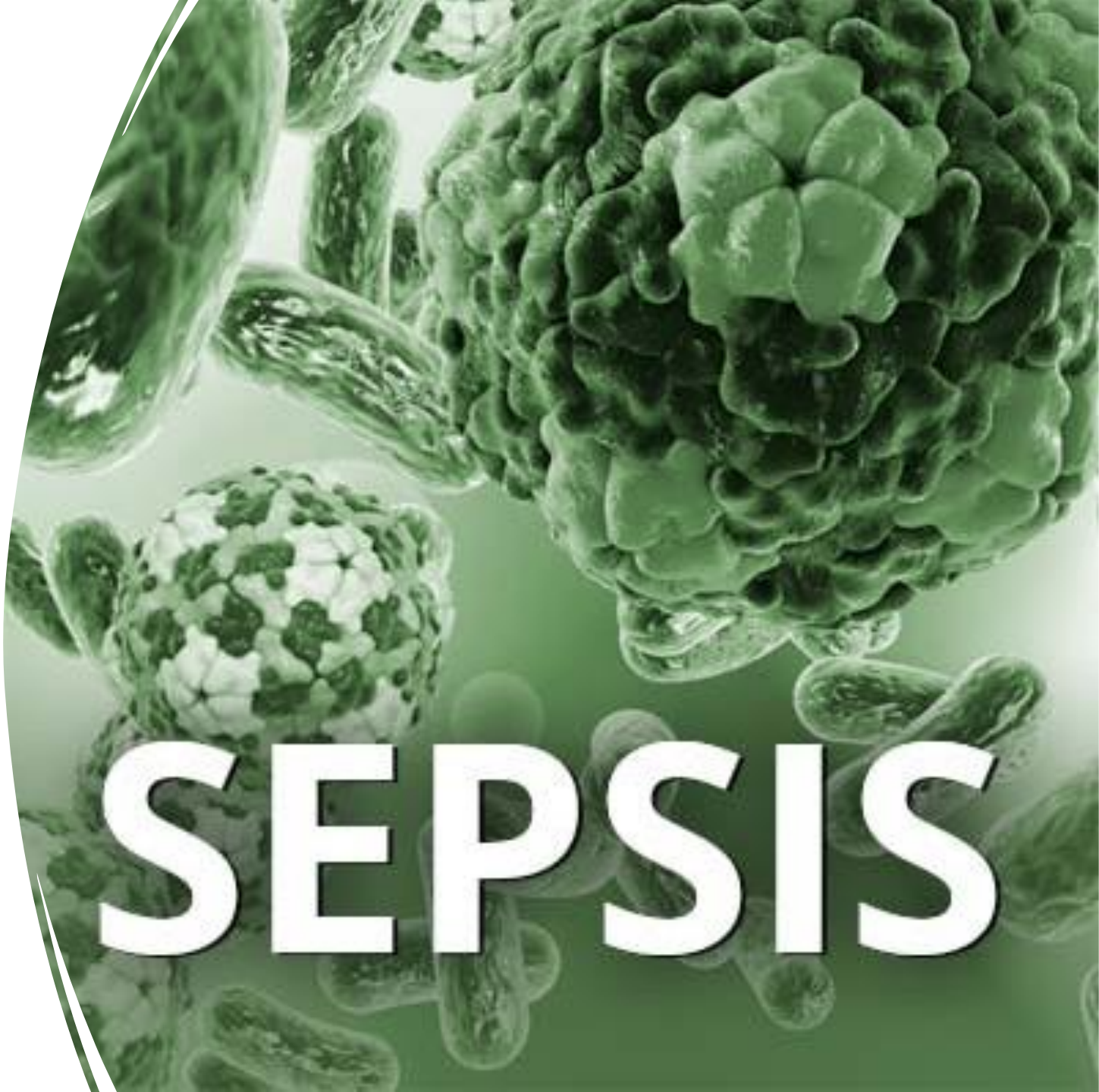
Definitions

What is the definition of sepsis?

What is the definition of septic shock?

What are the components of the SOFA score?

What are the components of the qSOFA score?



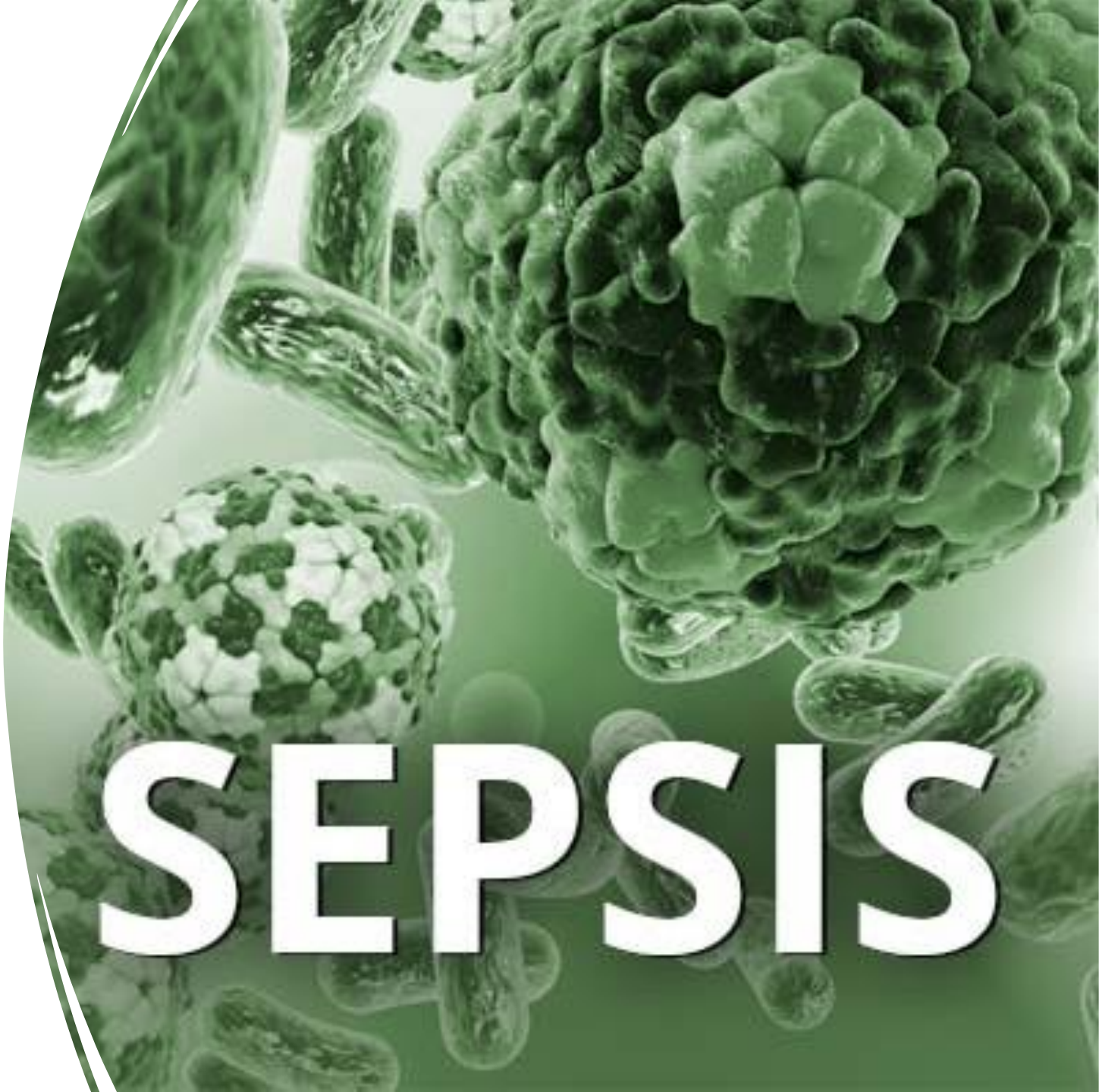
Validated tools

What are validated clinical decision-making tools?

Why do we use VCDTs?

What tools are available for sepsis?

Which tools should I use?



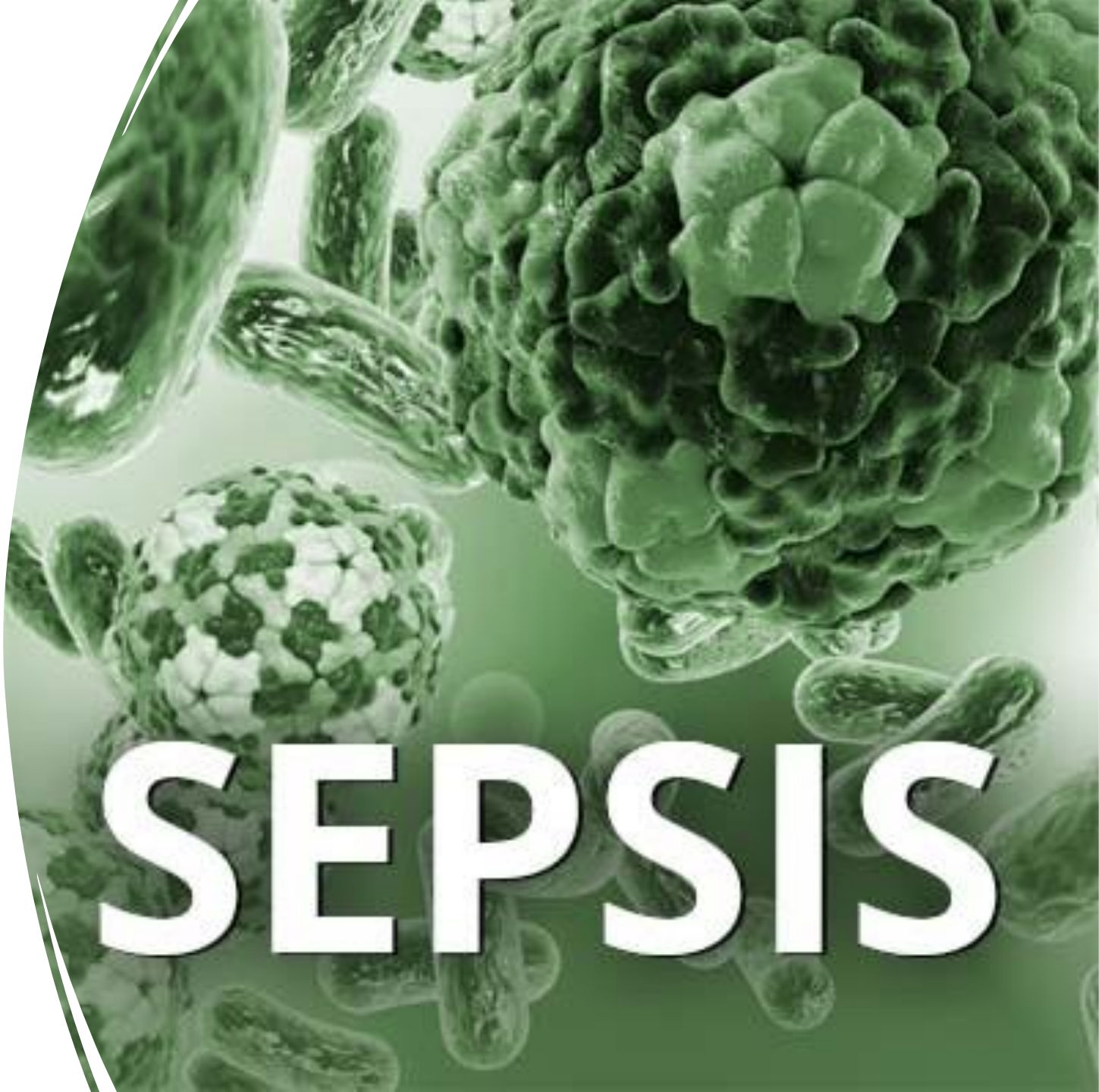
Pathophysiology

What type of infection is usually causing sepsis?

What is happening in the body?

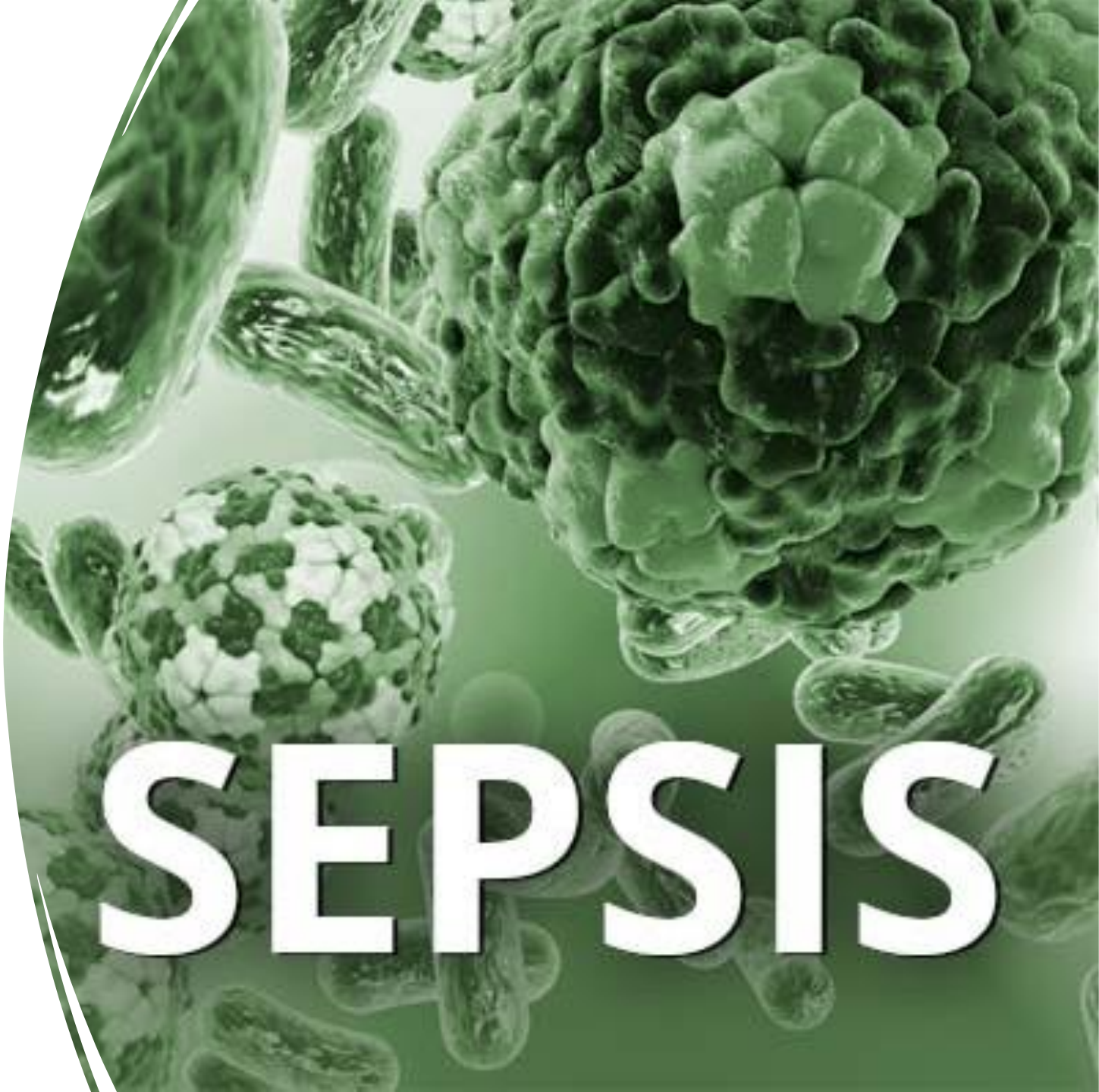
What is occurring at the organ level?

Cardiac, Lungs, GI, Liver, Kidneys, Nervous system, Immune system



Bird’s eye view

What are the basic principles to sepsis management?



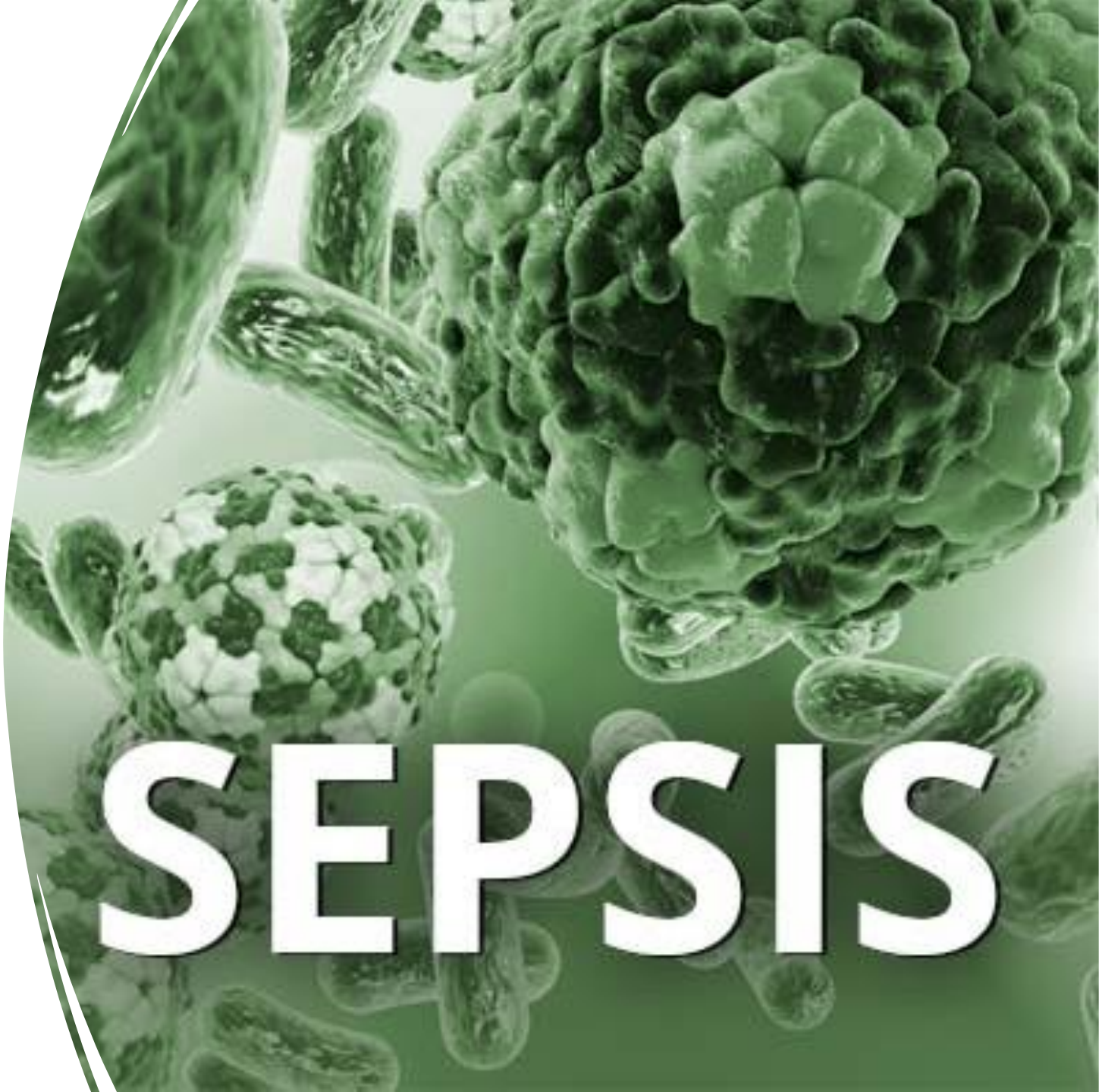
Fluids

What fluids are recommended?

What is the rate of infusion?

How do you assess fluid responsiveness?

When should you restrict fluids?



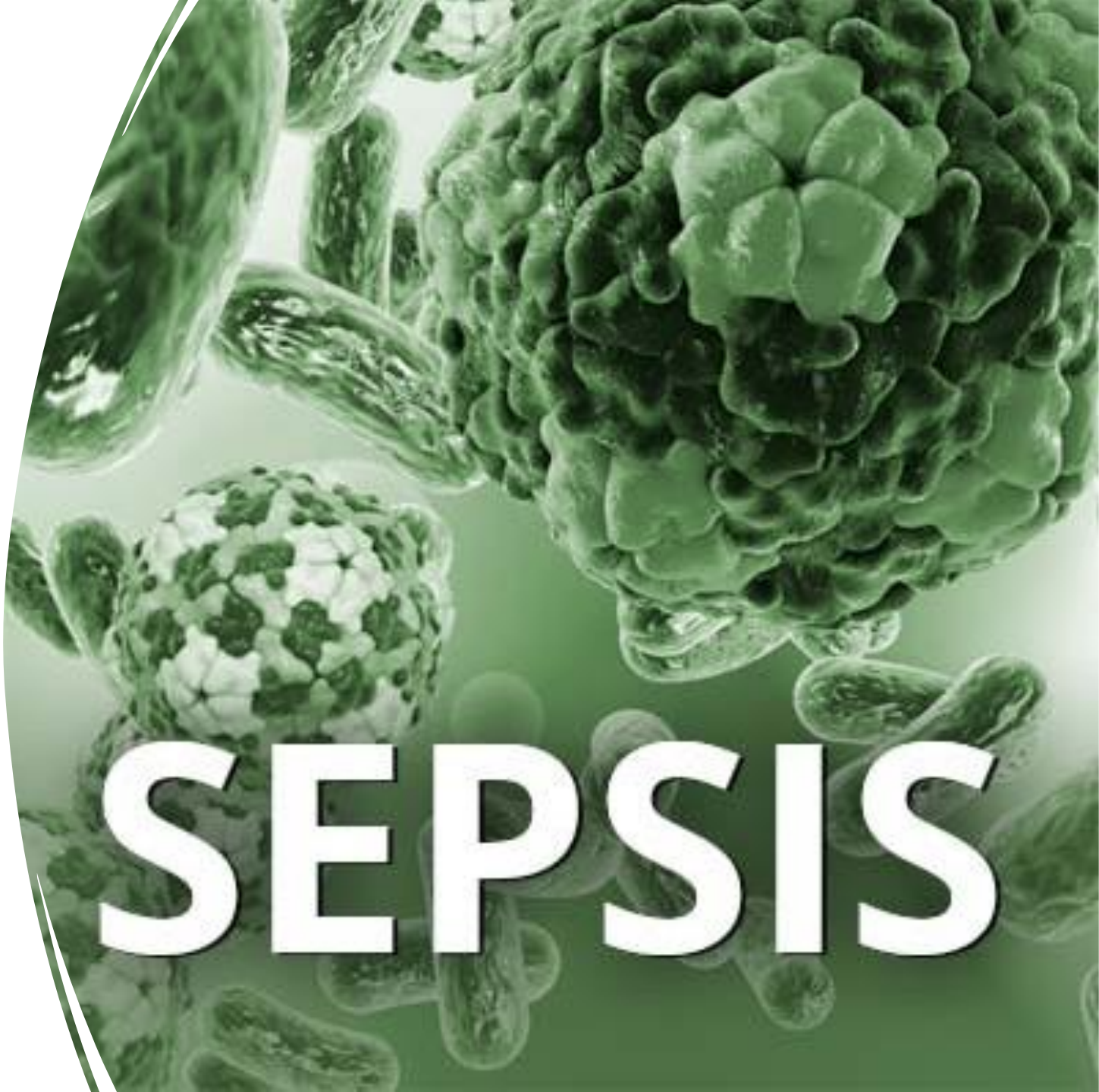
Antibiotics

How do I choose the right antibiotic?

What regimen should I choose?

When should antibiotics be started?

How long should antibiotics be administered?



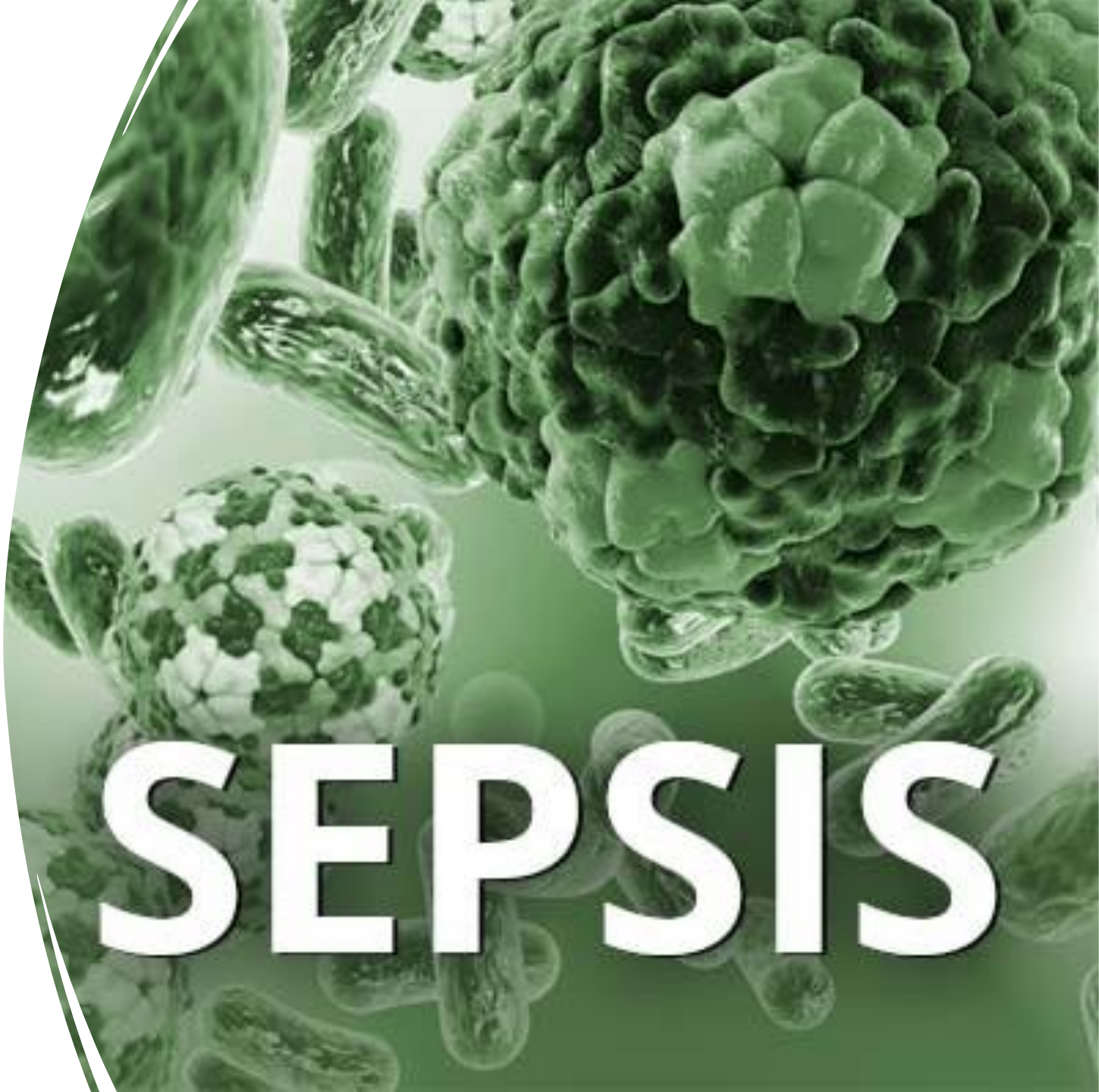
Pressors

When are pressors indicated?

Which pressor do you choose?

Goal of pressor use?

Timing of pressor use?

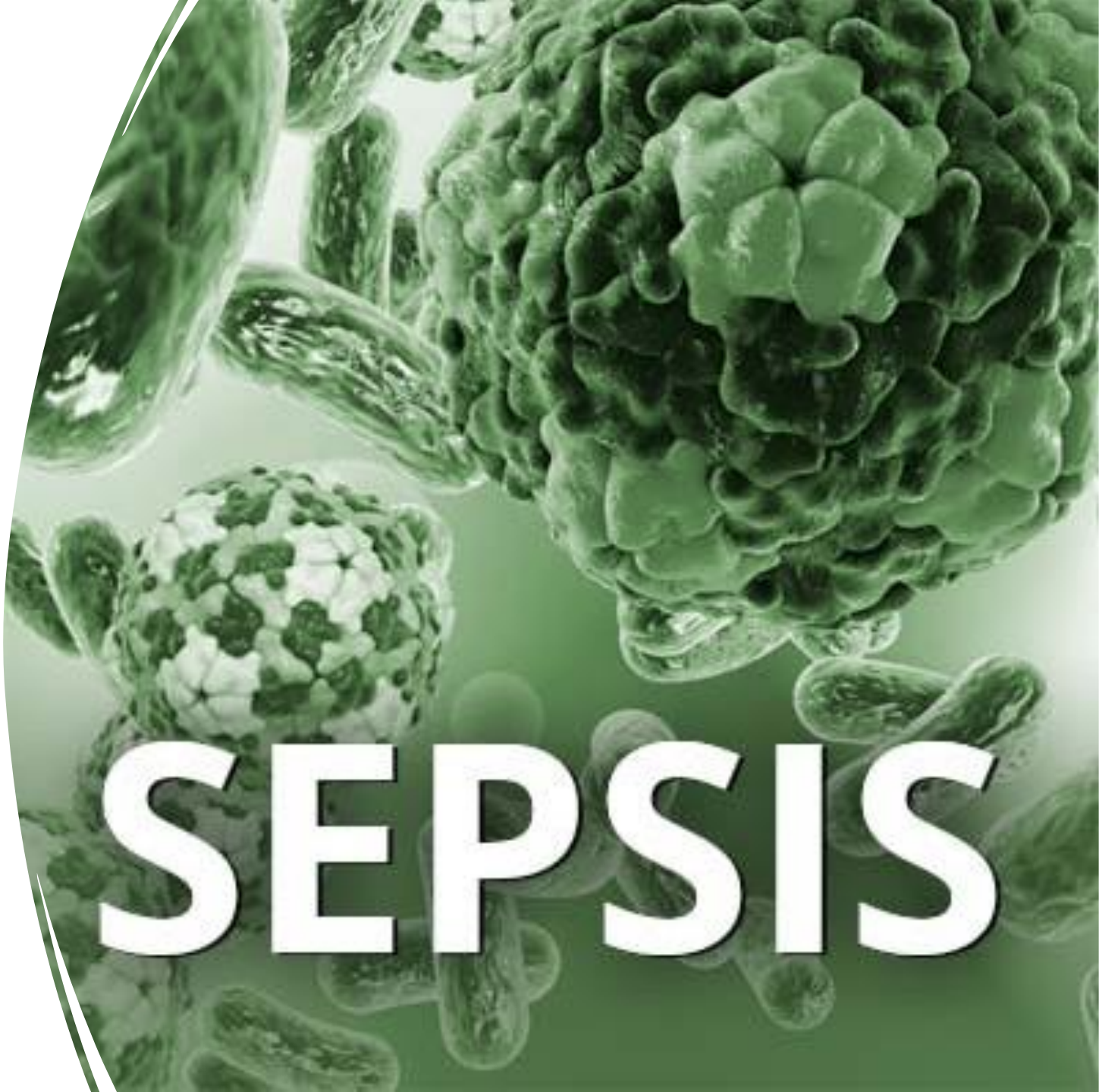


Investigations

What lab studies need to be ordered?

What lab studies can be ordered if clinically indicated?

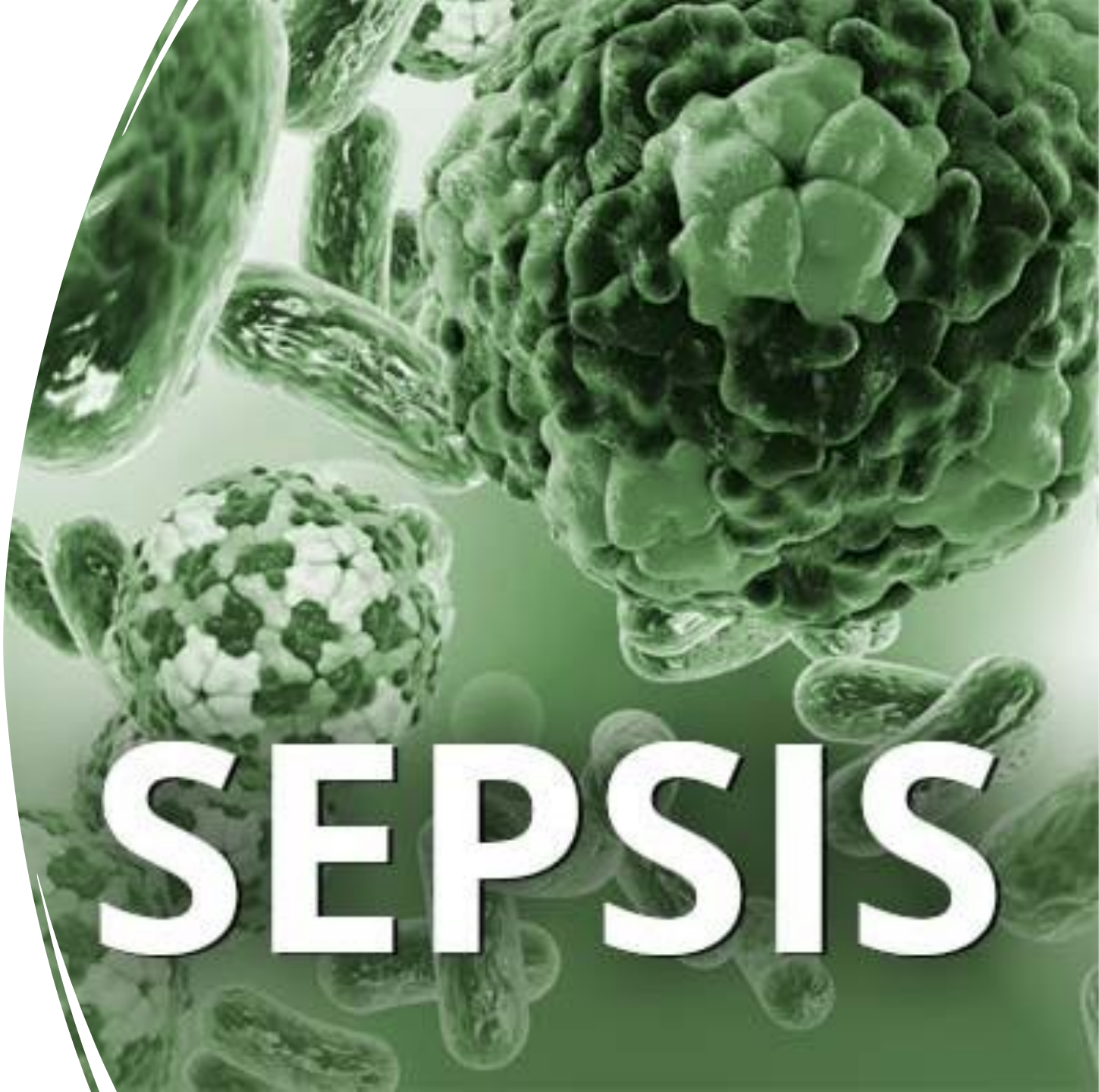
When do I order imaging studies?



Adjunctive

What are the clinical indications for:

- Corticosteroids
- Transfusions
- Hyperglycemia
- Renal replacement therapy
- DVT prophylaxis
- Stress ulcer prophylaxis
- Nutrition

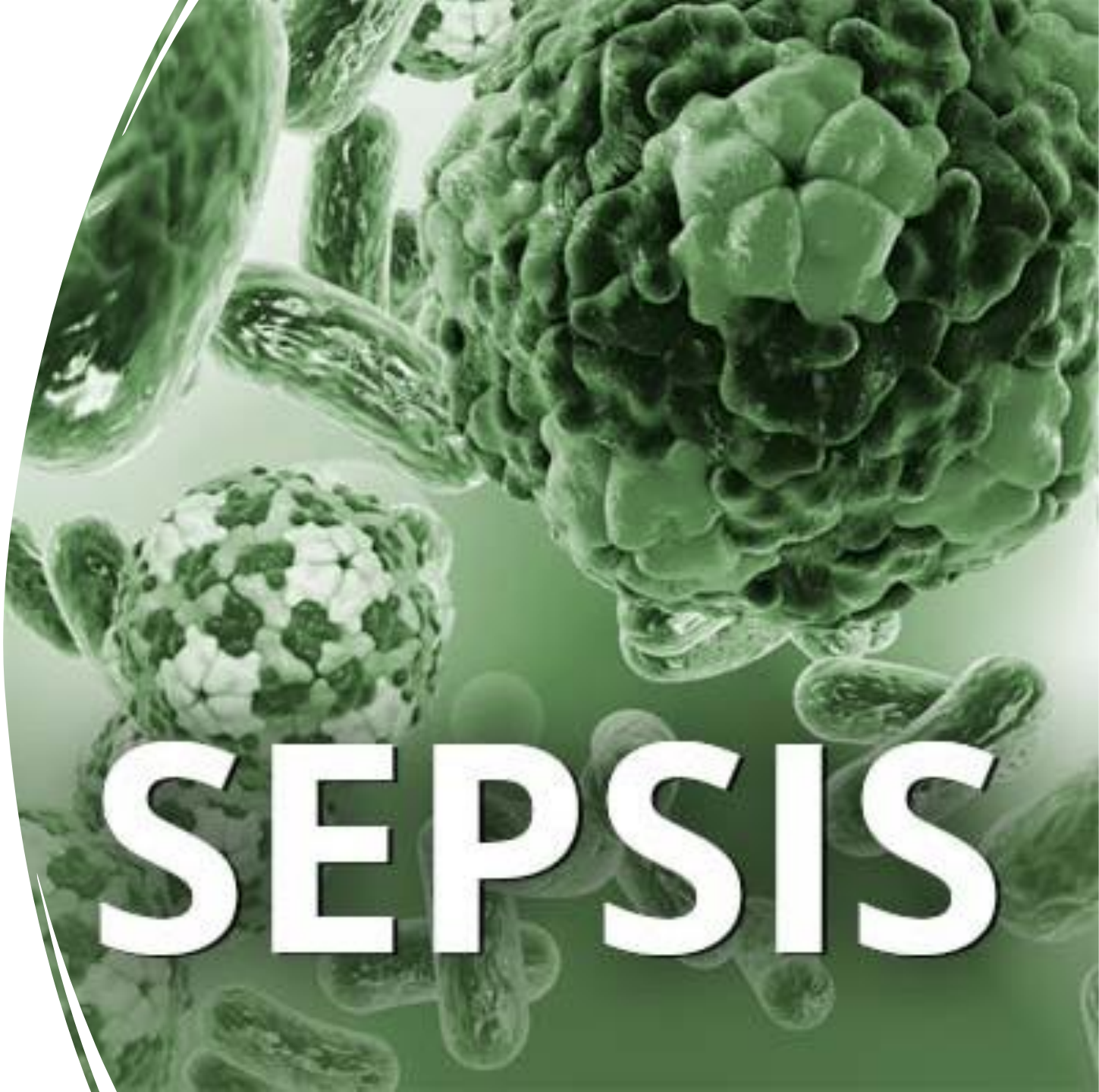


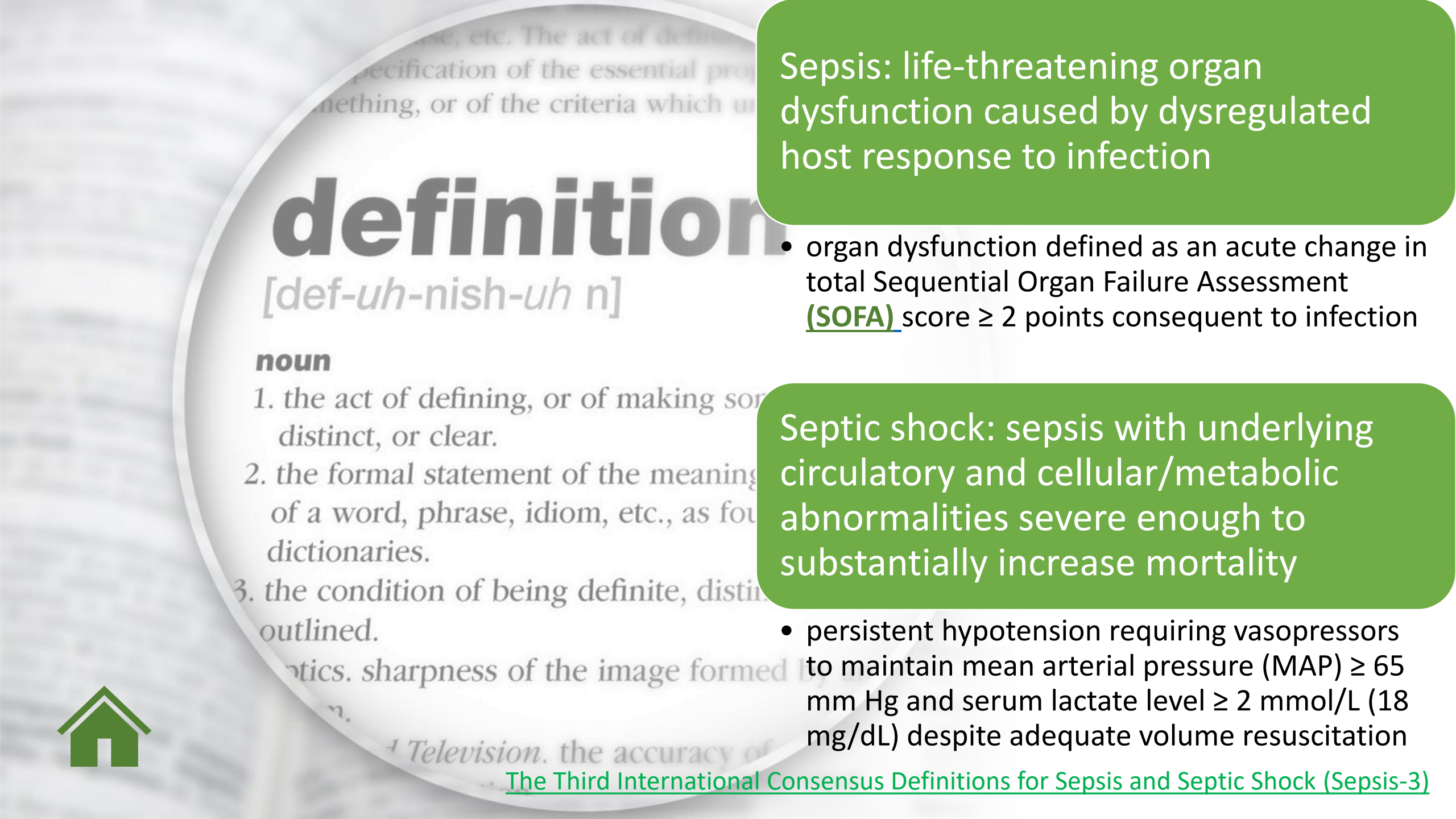
Quality

Why are checklists important in medicine?

What is on the early management checklist (within 1 hour)?

What is on the resuscitation phase check list (first 6 hours)?





Sepsis: life-threatening organ dysfunction caused by dysregulated host response to infection

- organ dysfunction defined as an acute change in total Sequential Organ Failure Assessment (SOFA) score ≥ 2 points consequent to infection

Septic shock: sepsis with underlying circulatory and cellular/metabolic abnormalities severe enough to substantially increase mortality

- persistent hypotension requiring vasopressors to maintain mean arterial pressure (MAP) ≥ 65 mm Hg and serum lactate level ≥ 2 mmol/L (18 mg/dL) despite adequate volume resuscitation

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Validated Decision Making Tools

Validated clinical decision-making tools combine findings from several elements to help health care providers describe the likelihood of a disease, determine prognosis and guide treatment (Strep score, Ottawa Ankle Rules)

Evidence based ○ decrease time to treatment ○ minimize medical waste ○ decrease risk ○ quality indicators ○ M&M

Examples: qSOFA, SOFA, SIRS, NEWS, MEWS, PIRO, MEDS

SOFA vs qSOFA

Pulmonary – Oxygen requirements

- Arterial hypoxemia ($PaO_2/FIO_2<300$)

Renal - Creatinine

- Acute oliguria <0.5mL/kg/hour
- Creatinine increase 44.2 mcmol

Neurologic – mental status

- Glascow Coma Score

Coagulation

- Platelet count < 100,000

Liver function

- Total bilirubin > 70 mmol/L

Cardiovascular

- Systolic blood pressure < 90 mmHg
- MAP < 65 mmHg

Respiratory

- Rate ≥ 22 per minute

Neurologic

- Altered mental status

Cardiovascular

- Systolic pressure ≤ 100mmHg

Pathophysiology

- ***Bacteria***
  - E coli, Staph aureus, klebsiella pna, strep pna
- Fungus
- Virus
- Parasite

Pathogen

Local infection

- ***Respiratory***
  - Pneumonia
- GI
- GU
- Skin/soft tissue

- **Generalized edema**
  - Endothelial changes
- **Microthrombi**
  - obstruction
- **DIC**

Systemic inflammatory response

Tissue damage

Pathophysiology

Cardiac	Capillary permeability increases and compromises vascular volume
	Smooth muscles fail to contract leading to vasodilation
	Cardiac output decreases
Lung	Endothelial changes cause ventilation mismatch, arterial hypoxemia and reduced lung compliance
GI	Permeable gut epithelium cause bacterial translocation, gut injury from autodigestion by pancreatic enzymes
Liver	Impaired hepatocyte clearance of bilirubin impairs other important hepatic functions
Kidney	Cytokine and immune mediated microvascular/tubular dysfunction
	Decreased perfusion leads to widespread tubular necrosis
Nervous system	Blood brain barrier is compromised due to endothelial dysfunction leading to edema, oxidative stress, leukoencephalopathy, neurotransmitter alterations
	Hepatic and renal dysfunction add to influx of toxins
	Coagulopathy and impaired blood flow can lead to ischemia and hemorrhage
Immune system	Proinflammatory state develops into prolonged state of immune system dysfunction increasing susceptibility to new infections

Bird’s eye view

Early recognition

Early fluid

Early broad-spectrum antibiotics

Appropriate labs

Source control

Frequent assessments

Fluids

SEPSIS 3 recommends crystalloid IVF at 30mL/kg within first 3 hours for hypotension or lactate≥4

- 0.9%NS, ringer lactate, Plasma-lyte-A
- Hemodynamic effects of the bolus only last 60 minutes

Assessing response

- Dynamic blood pressure response
  - Blood pressure, heart rate, passive leg raise, IVC diameter
- Tissue perfusion
  - Lactate level, cap refill
- Urine output
  - 0.5 mL/kg/hour

Restrict fluid in the latter stages

- Net fluid balance should be ~0 or negative by 72 hours
  - Each 1 L in net fluid balance at 72 hours is associated with increased risk of death

Antibiotics

CHOICE

Patient history

- potential source of infection
- likely pathogen
- microbial resistance
- patient organ dysfunction
- associated drug toxicities

INITIATE

Early within 1 – 3 hours

- 90 minutes?

REGIMEN

Start broad and empiric, then narrow once cultures are available

- Pulmonary
- Intra-abdominal
- Complicated UTI
- Bacterial Meningitis
- Skin/Soft tissue
- Unknown

DURATION

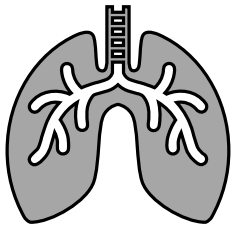
Usually 7-10 days

- Longer courses for endocarditis, osteomyelitis, colonized devices

Pulmonary

Consider:
ATT/co-trimoxazole
Metronidazole (aspiration/anaerobe)
Fluconazole: crypto/HIV

- Ceftriaxone 1-2g/day IV plus azithromycin 500mg qd
- Ceftriaxone 1-2g/day IV plus doxycycline 100mg qd
- Levofloxacin 750mg/day IV or moxifloxacin 400mg IV qd
- Levofloxacin 750mg/day IV and
  - Pipercillin/tazobactam 4.5g IV qid or
  - Cefipime 2g IV tid or
  - Meropenem 1g IV tid
  - Imipenem/cilastatin 500mg IV qid



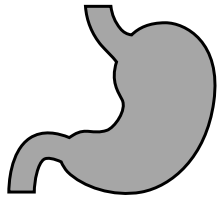
Intra-abdominal

Consider

Ceftriaxone + metronidazole

Co-trimoxazole: HIV

- Piperacillin/tazobactam 3.375g IV qid
- Meropenem 1g IV tid
- Imipenem/cilastatin 500mg IV qid
- Cefepime 2g IV bid and
  - Metronidazole 500mg tid-qid



Complicated UTI

Pyelo consider:
Cefelexin+Co-trimoxazole

Ceftriaxone 1g IV daily

Ciprofloxacin 400mg IV q12

Levofloxacin 750mg IV daily

MDR

- Cefepime 2g IV bid or
- Piperacillin/tazobactam 3.375 – 4.5g IV qid or
- Meropenem 1g IV tid and vancomycin 15mg/kg IV bid

Meningitis

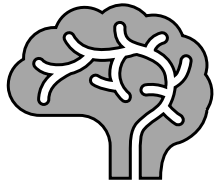
Crypto:
Amphotericin B 1mg/kg/d +
Fluconazole 1200mg+
Flucytosine 25mg/kg QID

>50yo Vancomycin 15-20mg/kg IV q8-12 and

- Ceftriaxone 2g IV and
- Ampicillin 1-2g IV q3-4h (max 14g/day) and
- Dexamethasone 0.4mg/kg/dose q12h x4 days (not with HIV)
- Acyclovir 10mg/kg IV tid until herpes is ruled out

<50yo Vancomycin 15-20mg/kg IV q8-12 and

- Ceftriaxone 2g IV bid and
- Dexamethasone 0.4mg/kg/dose q12h x4 days (not with HIV)
- Acyclovir 10mg/kg IV tid until herpes is ruled out



Skin/Soft Tissue

Vancomycin and linezolid and

- Piperacillin/tazobactam or
- Carbapenem or
- Cefepime and metronidazole

Consider:

Clindamycin

Animal bite: amoxicillin/clavulanic acid

Or metronidazole + co-trimoxazole

Unknown

Vancomycin and levofloxacin and

- Piperacillin/tazobactam or
- Carbapenem or
- Cefepime

Consider:
Ceftriaxone + metronidazole
HIV: + co-trimoxazole 5mg/kg IV TID + fluconazole 400mg PO QD
TB: Rifampin, Isoniazid, pyrazinamide and ethambutol
Crypto: AmphoB 1mg/kg/d, flucytosine, fluconazole 1200mg/d

Vasopressors

Initiate

- if initial fluid resuscitation fails to restore a MAP ≥ 65 mmHg

Goal

- MAP ≥ 65 mmHg

Duration

- Shortest time possible

First line
- Norepinephrine 2-5mcg/min titrated to 35-90 mcg/min

Add
- Vasopressin up to 0.03 u/min

Add
- Adrenaline 20-50 mcg/min

Investigations

Labs — Needed

- FBC
- CMP
- Lactate
- Urinalysis and culture
- 2 sets of blood cultures
- Coagulation studies

Labs — If indicated

- ABG
- Sputum culture
- Stool culture
- Joint aspiration culture
- Pleural aspiration culture
- Peritoneal fluid culture
- Skin/soft tissue culture
- CSF studies

Imaging — If indicated

- Chest x-ray
- ECG
- CT chest
- CT abdomen/pelvis
- POCUS

Adjunctive therapy

Corticosteroids

- Low dose long course if needing ongoing moderate-high dose vasopressors
- Hydrocortisone 200-400mg/day >3 days

Transfusions

- Use restrictive instead of liberal strategy (Hb<7)
- Give platelets if < 10, if < 20 and bleeding risk with goal of 50

Hyperglycemia

- Initiate insulin if glucose ≥ 10, goal 8-10

Renal replacement therapy

- Not indicated for high creatinine or oliguria
- Indications pneumonic AEIOU

DVT prophylaxis

- Give pharmacologic prophylaxis

Stress ulcer prophylaxis

- If risk factor for GI bleed give PPI or H2 blocker

Nutrition

- Consider early enteral nutrition < 72 hours

Quality checklist

Checklists

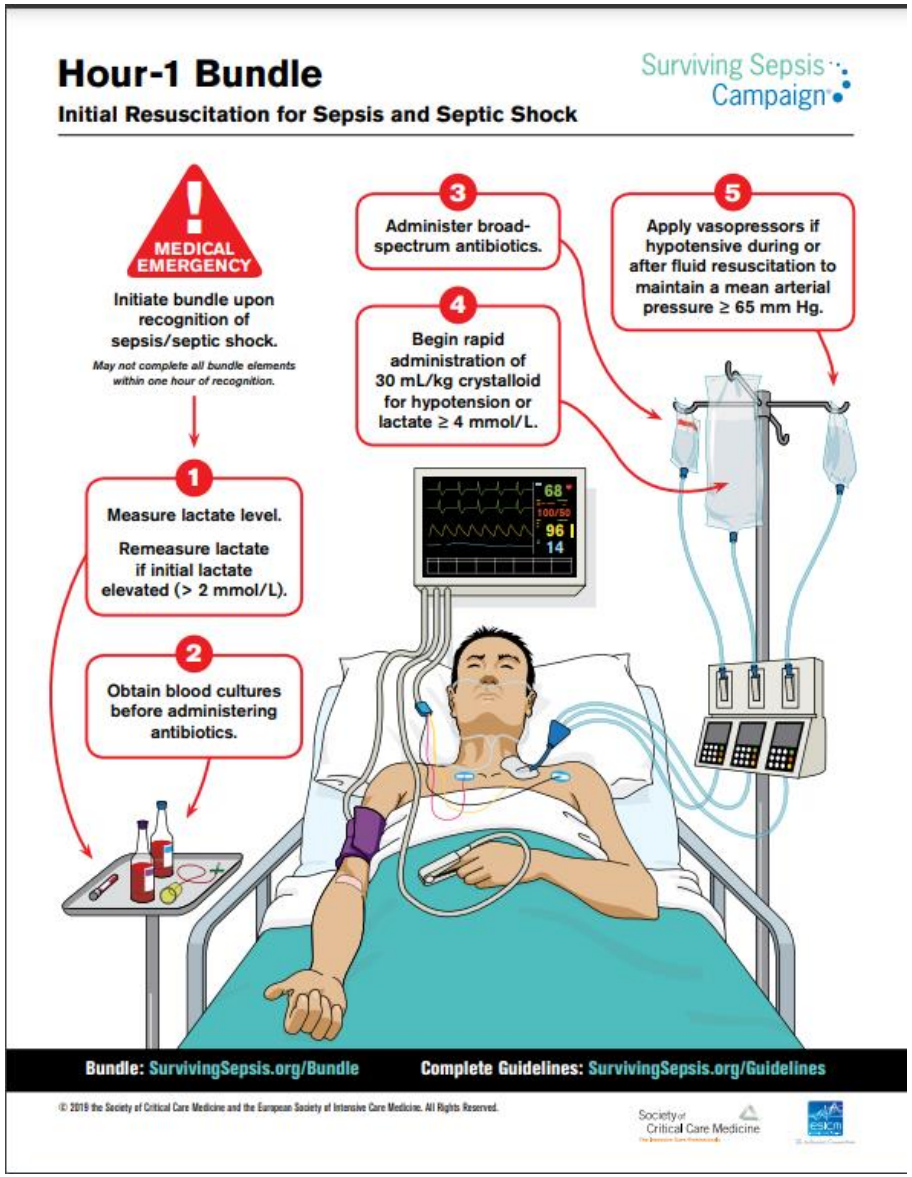
✓processes, M&M, errors, verification of completeness, higher adherence to quality indicators

Non-compliance in 6-hour sepsis bundle: 2 fold increase in death

Non-compliance in 24-hour sepsis bundle: 76% increase in death

Strict adherence to time protocols may lead to delayed care and increased mortality

1 hour bundle


Hour-1 Bundle
Initial Resuscitation for Sepsis and Septic Shock
Surviving Sepsis Campaign
MEDICAL EMERGENCY
Initiate bundle upon recognition of sepsis/septic shock.
May not complete all bundle elements within one hour of recognition.
1
Measure lactate level.
Remeasure lactate if initial lactate elevated (> 2 mmol/L).
2
Obtain blood cultures before administering antibiotics.
3
Administer broad-spectrum antibiotics.
4
Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.
5
Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.
Bundle: SurvivingSepsis.org/Bundle
Complete Guidelines: SurvivingSepsis.org/Guidelines
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